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Kupukupu Fern

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Kupukupu fern, *Nephrolepis cordifolia* (L.) C. Presl., is in the sword fern family (Nephrolepidaceae). It is also called sword fern, narrow sword fern, tuberous sword fern, erect sword fern, fishbone fern, and, in Hawaiian, ʻōkupukupu and niʻaniʻau. Earlier names given it by botanists are *Polypodium cordifolium* L., *Aspidium tuberosum* Bory, and *Nephrolepis tuberosa* (Bory) C. Presl.

This hardy fern is indigenous to Hawai'i and is one of the first plants to appear on lava fields. It is common on all the main Hawaiian Islands in dry to wet forests and lava fields, and it is found throughout the tropics (South America, Mexico, Asia, and the South Pacific) in similar environments.

At least five *Nephrolepis* species are found in the wild in Hawai'i. Of these, only two are native: the indigenous *N. cordifolia* described in this publication, and another, larger, endemic plant, *N. exaltata* subspecies *hawaiiensis*. The other three species are naturalized alien plants that may become invasive. They can hybridize with the native species and thereby alter their genetic makeup.

Characteristics

Kupukupu is a medium-sized terrestrial or epiphytic fern with erect, narrow fronds 1–2 feet tall composed of many smaller pinnae (frondlets) about 1–1½ inches long. It has stolons that spread out across the surface of the soil or growth medium and may climb trees or tree ferns.

Kupukupu is sometimes mistaken for its close relative, the common Boston fern, *N. exaltata*, but kupukupu has stiff, narrower fronds and forms scaly tubers on its root system. The most distinguishing characteristic of this fern is that it is the only *Nephrolepis* species in Hawai'i to have underground tubers that develop on the stolons; the tubers store food, and new ferns can develop from them.

The fronds are 12–28 inches long and 2–2½ inches wide and may be erect or drooping. They follow a narrow, linear, and generally uniform profile, except at their bases and tips. They are glossy and yellowish-green to dark green. The frond petioles are a tenth to an eighth of the frond length and have dark brown centers with tan margins. The con-

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vex pinnae are oblong, narrow, and either heart-shaped or with the upper lobe longer. They are up to 1 inch long by ⅓ inch wide (ranging from two to six times longer than wide), and they often become deciduous with age. Raised, bean-shaped sori (clusters of sporangia) are found on the underside of mature pinnae (frond leaflets), aligned in rows toward the outer edge.

Horticulture

Kupukupu is hardy and can tolerate most soil conditions, but it grows best in a moist, well drained soil or medium, such as volcanic cinder or cinder-soil mixtures. Optimum pH of the medium is slightly acidic (pH 5.5–6.5) to neutral (pH 7.0).

The fern grows well in full sun and partial shade. Indoors, it can be kept on partially lit windowsills with fluorescent or incandescent lighting as a supplemental light source. In the wild, it is found in areas with temperatures from 40 to 90°F and at elevations from 10 to 4000 feet above sea level. It tolerates a range of soil and climatic conditions, has moderate wind resistance, and tolerates occasional drought, but it is not salt tolerant.

Supplemental irrigation may be needed to keep the soil or medium moist. Do not allow the fern to sit in standing water, or it will turn yellow and defoliate.

Light fertilizer applications can be beneficial. Supplemental nitrogen will help reduce yellowing of the leaves and encourage stem and leaf growth. If using a complete N-P-K (nitrogen-phosphorus-potassium) fertilizer, follow the instructions on the label and be sure not to over-fertilize. Excessive fertilizer can lead to a damaging accumulation of salinity in the medium. Fertilizers with a higher level of nitrogen are recommended, such as the Nutricote® 18-6-8 controlled-release formulation. This particular fertilizer is commonly used in nurseries where ferns are propagated.

Occasional thinning and removal of dead or old fronds can be beneficial in encouraging air circulation throughout the plant canopy, thereby aiding healthy plant growth.

Landscape uses

This plant is well suited for low border plantings because of its stiff fronds, and it is commonly used as a decorative groundcover. It is used as an accent plant around landscapes or pōhaku (stones) or planted as a mass groundcover. To avoid competition and subsequent dieback, do not plant them too close together. The average diameter of a well established cluster is 24–36 inches, so spacing between plants in new plantings should be planned accordingly.

When planting this fern outdoors in landscapes, be sure to take precautions, because under the right conditions kupukupu can spread freely and invade other planted areas if left unattended. The dense, tuberous root system may cause competition with other plants for space and nutrients, stunting their growth.

Propagation

As with many ferns, kupukupu can be propagated both by spores and vegetative divisions. Spores should be sown on the surface of a medium kept moist until they sprout. Divisions separated from the main cluster should be trimmed of old fronds and bulbs before replanting. Cover the root system to just above the crown, where the frond stems begin. Underground stems (stolons) develop many rounded tubers. These storage and reproductive organs can be removed, along with a small piece of stolon, and potted to obtain a separate plant.

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